

## Description

*A method, process and computer program to automatically create a customized three-dimensional nail object by library reference*

### CROSS REFERENCE TO RELATED APPLICATIONS

- [0001] This application references U.S. patent application Serial No. 10/708,065, filed Feb. 6, 2004.

### BACKGROUND OF INVENTION

- [0002] While working with fingernails and fingernail objects for several years, there was no easy way to automatically create a three-dimensional model of an artificial fingernail object. In fact, most software in the market allows a user to manually manipulate and create just about any three-dimensional object conceivable, but the process of doing this manually is very time consuming and allows for too much human error when creating artificial fingernails with a consistent and reliable appearance. Because of this the

inventors set out to find a method to create artificial fingernail objects automatically and this invention was the result.

- [0003] One simple way to create the desired artificial nail object is to establish a library of three-dimensional nail objects with subtle variations along the X-axis, Y-axis and Z-axis. This library can then be easily accessed and the desired nail object file utilized in any circumstance where an existing digitized nail surface area matches the parameters of the library nail object.
- [0004] By creating a variety of three-dimensional nail objects, the inventors were able to successfully establish a library that makes it simple and easy to rapidly create a customized three-dimensional nail object for any purpose.
- [0005] The advantage of this invention is that with relative ease and very little labor a desired customized and preferred three-dimensional artificial nail object can be created. This invention has many applications, particularly with fingernail and toenails.
- [0006] This new desired three-dimensional object has many applications, not the least of which is the ability to physically create the nail object for the individual and supply them with an artificial nail for use as a cosmetic or even pros-

thesis. The invention can now save time and virtually guarantee consistent looking fingernail objects, all accomplished with relative ease.

## SUMMARY OF INVENTION

[0007] The invention is a method, process and computer program to automatically create a customized three-dimensional artificial nail object by library reference based upon an actual/existing digitized nail surface. This particular invention generates the overall desired three-dimensional nail object by taking measurement reference points of the digitized nail surface and selecting an appropriate finished three-dimensional artificial nail object that matches the reference points thus creating a preferred artificial nail object. The application of the invention results in a wide scope of possible implementations including a use for creating artificial fingernails and artificial toenails.

## BRIEF DESCRIPTION OF DRAWINGS

[0008] Fig. 1 is a diagram demonstrating the Axis, periphery and digitizing of the nail surface object.

[0009] Fig. 2 is a diagram illustrating the library selection process and combining of the digitized nail surface with the

library selected nail object.

- [0010] Fig. 3 is a diagram showing the new customized nail object fitting over the digitized surface.

#### DETAILED DESCRIPTION

- [0011] By starting with an existing digitized three-dimensional surface point array of an actual fingernail or toenail, the invention permits the automatic creation of a new customized three-dimensional object that will fit over the actual fingernail or toenail. This is accomplished by measuring key points of data contained in the digitized array. The key points are measurement values in millimeters or inches along the X-axis, Y-axis and Z-axis. Further, the arcs and curves of the digitized nail surface are also determined along the X-axis and Y-axis. Additional key points are found in the periphery points along the digitized nail surface.
- [0012] Once the key points are evaluated, a selection process is handled whereby preexisting representations of three-dimensional nail objects are compared from a library of existing three-dimensional nail objects; and the best comparable nail object that also represents the desired overall appearance is then manipulated and utilized.
- [0013] In order to successfully create the desired customized nail

object an additional step is necessary to customize the bottom fit of the new library selected nail object. This is achieved by aligning the digitized nail surface with the bottom of the library selected nail object. Where the two objects intersect, the three-dimensional points of the digitized nail surface are used and the intersecting points of the library select nail object are dropped, thus combining the two three-dimensional objects into one.

- [0014] To insure a custom fit, the periphery points are evaluated, and in any instant where the library selected nail object point array overhangs the cuticle end of the digitized nails surface, they are dropped and the remaining points are combined with the digitized nail surface to create a customized three-dimensional representation of the cuticle fitting which will allow the finished three-dimensional nail object to fit over the digitized nail surface. Likewise, any time voids occur (where the library selected nail object file doesn't have enough points to match the digitized nail surface cuticle periphery), three-dimensional points are added to the library selected nail object so that it fits the entire customized cuticle periphery. The result is a new customized three-dimensional nail object that has the desired appearance and will fit over the digitized nail sur-

face.

- [0015] In Fig. 1 the first step of the process is demonstrated, where a *digitized nail surface* 100 is shown and the orientation of the X, Y and Z Axis is established. Here the *X-axis* 110 is found along the width of the *digitized nail surface* 100; the *Y-axis* 120 is the length of the *digitized nail surface* 100 and can be determined initially by measuring from the cuticle to the tip of the *digitized nail surface* 100; and the *Z-axis* 130 represents the height or depth of the *digitized nail surface* 100. Additionally, the *periphery points* 140 of the *digitized nail surface* 100 are also determined in the first step to insure that the *digitized nail surface* 100 dimensions will fit into the *library selected nail object* 200. All of these reference points are utilized in the selection process for the *library selected nail object* 200, which will eventually be manipulated to create the new three-dimensional data representing the final three-dimensional *customized nail object* 210.
- [0016] Measuring the digitized surface area includes creating a relationship of the *X-axis* 110, *Y-axis* 120 and *Z-axis* 130 to millimeters or inches, further arcs and curves of the *digitized nail surface* 100 are determined by measuring and creating relationships between the three-dimensional points

of data along the *X-axis* 110, *Y-axis* 120 and *Z-axis* 130.

These curves and arcs are utilized and manipulated during the *library nail selection object* 200 process, in an effort to make the *customized nail object* 210.

[0017] Once the *library selected nail object* 200 is determined, the *digitized nail surface* 100 is aligned to the bottom surface of the *library selected nail object* 200. At the intersection of the two three-dimensional object arrays, every point of intersection of the *library selected nail object* 200 will be dropped to give way to the intersecting points of the *digitized nail surface* 100, thus creating a customized fit along the bottom of the *customized nail object* 210.

[0018] By utilizing the *periphery points* 140 along the cuticle of the *digitized nail surface* 100 as reference points, any voids or overhangs will be handled. In the event of an overhang of points in the *library selected nail object* 200, those points that exist beyond the *digitized nail surface* 100 will be dropped so that the *library selected nail object* 200 will align along the curves of the cuticle. In the event of a void, meaning that the *library selected nail object* 200 is missing a point that should exist to match with the cuticle points of the *digitized nail surface* 100, those points will be created in the *library selected nail object* 200 so that the *library selected*

*nail object* 200 will align along the curves of the cuticle.

[0019] Fig. 2 shows the combination of the *library selected nail object* 200 with the *digitized nail surface* 100 thus creating a *new customized nail object* 210.

[0020] Fig. 3 shows the *new customized nail object* 210 fitting over the top of the original *digitized nail surface* 100.

[0021] By completing the steps above, virtually any software program or user would be capable of creating a desired and customized three-dimensional artificial nail object. The entire objective of the preferred embodiments of the invention has been to create a simplified method, process and computer program to automatically create a customized three-dimensional nail object by referring to a library of preexisting nail objects and combining the best comparable of the library with an existing nail surface into a preferred artificial nail object. The application of this invention is extensive and plentiful, as with this invention it will become trivial to generate desired three-dimensional artificial nail objects by automation quickly and easily. Because of the advantages inherent in this invention it is anticipated that many variants of this invention are possible, which should be included within the preferred embodiments and descriptions of this invention.